APPLICATION FOR

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of

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for

IMPROVED AMMUNITION FOR PISTOLS AND CARBINES

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IMPROVED AMMUNITION FOR PISTOLS AND CARBINES

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to devices, systems, and processes related to improved ammunition for pistols and carbines, and more particularly that for small arms.

Brief Description of the Related Art

[0002] Many ammunition types are known in the prior art, especially those designed to fit larger weapons firing a projectile, such as rifles. These larger weapons typically seek to increase the velocity of the projectile by using a reduced case diameter at the front of the case where the projectile is fitted. This technique leads to a case that is usually described as "necked". For compact cartridges in pistols, this technique has been employed and to some degree achieves the required velocities with small projectiles, where small projectiles typically have a diameter of between 5 and 6 millimeters. However, current designs of a necked pistol cartridge which achieve the required velocities with small projectiles typically have a short, large diameter case with a very large change in diameter between the case and the neck. In such a cartridge design, two inefficiencies occur that actually prevent the cartridge from achieving the desired effect .

[0003] First, as the volume within the cartridge is limited by the requirement for compact dimensions it is necessary to employ an energetic propellant which by its nature will release combustion products quickly. However the large ratio of cartridge diameter to neck diameter will only allow combustion products to pass into the barrel and hence propel the projectile at a certain rate, the cartridge being effectively choked. For the small cartridge these two constraints oppose one another and it becomes very difficult to provide a

propellant that will release energy sufficiently slowly to not burst the weapon but still have enough energy within the given volume to achieve the required velocity. This problem generally becomes unsolvable with normally available propellants for cartridges intended to operate in a variety of environmental conditions, such as those typical for a military application. In particular, many military weapons must be able to operate in temperatures ranging from minus forty to one hundred twenty degrees Fahrenheit, and currently known cartridge designs have generally not achieved a sufficient release of energy within a small cartridge volume in such a wide range of temperatures using available propellants.

[0004] The second inefficiency resulting from having a necked cartridge is again related to the large changes in diameter required in the cartridge case. Such a cartridge, when fired, will achieve a high internal pressure. This pressure acts against the walls of the cartridge, but more importantly acts with equal and opposite force on the cartridge base or "head" and the area of transition to the cartridge neck. Because this transition area is large the force generated is now typical of that generated within a rifle cartridge and is generally much too great for the small mechanisms associated with a pistol. Employing a stronger and larger mechanism may solve this overloading. However, this negates the benefits of a small compact firearm. Although improved materials and tolerances may be used to withstand the higher pressures, such measures typically result in uneconomical manufacturing and provide a weapon that generally has a low reliability.

[0005] It is also generally known to employ a carrier or sabot to allow a smaller diameter projectile to be fired from a larger diameter weapon barrel in order to increase velocity. This is seen in prior art for a number of the large rifle cases and also for very large vehicle type weapons as such a technique is extremely efficient. However, using a carrier or a sabot within a smaller weapon, such as a sidearm or pistol, where a conventional cartridge case has essentially a uniform diameter, has not been successful. Particularly, in sidearms, the ratio of sabot mass to projectile mass is large and much of the propellant energy is wasted on moving the sabot. Further, while such a

design may increase the projectile's velocity, it has previously not been found to suitably accommodate small projectile diameters needed for armor penetration. Additionally, simply decreasing the diameter of the case to meet that of the projectile does not solve the problem because the ammunition will not reach sufficient exit velocity to penetrate armor. Moreover, using the uniform diameter case resulting in either the larger projectile mass or the slower exit velocities produces increased recoil in existing small firearms during firing.

[0006] Although current ammunition cartridges for larger weapons, such as rifles and machine guns, and for sidearms generally function well, conventional ammunition for such devices did not provide users of small arms with significantly increased projectile velocity while decreasing recoil felt by the firer. Prior devices also did not provide small arms ammunition firing a small diameter projectile that penetrates armor. Prior devices and methods further do not produce a compact ammunition with acceptable internal pressures that can be used in a variety of operational conditions and environments including large temperature fluctuations.

SUMMARY OF THE INVENTION

[0007] The invention relates to improved ammunition for pistols and carbines to provide a cartridge that may be used within the restricted dimensions of these weapons while increasing the effective range normally associated with such ammunition. Additionally, the invention may provide an increase in projectile velocity to impart sufficient projectile cross-sectional energy to allow the perforation of certain body armor types. The invention further provides a cartridge which, by means of diameter reduction of the case in the area of the front, and the application of a sabot or bore carrier assembly, allows a small diameter projectile, typically 5.56 millimeters, to be fired from a short compact ammunition that may be employed in a pistol size weapon. A weapon chamber is dimensioned to accept the cartridge as described at a tolerance that is preferably between approximately 3 and 9 one thousandths of an inch.

[0008] Still other objects, features, and attendant advantages of the present

invention will become apparent to those skilled in the art from a reading of the following detailed description of embodiments constructed in accordance therewith, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The invention of the present application will now be described in more detail with reference to preferred embodiments of the apparatus, given only by way of example, and with reference to the accompanying drawings, in which:
[0010] Fig. 1 illustrates a side elevation partial cross-sectional view of the complete ammunition assembly according to the present invention.
[0011] Fig. 2 illustrates a side elevation cross-section of a weapon chamber according to the present invention.
[0012] Figs. 3A and 3B illustrate preferred weapon chamber tolerances in accordance with the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0013] Referring to the drawing figures, like reference numerals designate identical or corresponding elements throughout the several figures.
[0014] The present invention has been made in view of the above circumstances and provides, among other things, small arms ammunition of the short compact type used in pistols and carbines. The ammunition is generally of such a form that the cartridge overall length is not greater than about 34 millimeters. In various applications, including law enforcement and military applications, the velocity generated by the ammunition of the present invention is significantly increased but with a decreased recoil felt by the firer. The ammunition preferably fires a small diameter projectile designed for penetration. The ammunition of the present invention also produces a high projectile velocity with minimized recoil within the confines of a compact ammunition without internal pressures being significantly higher than those

normally accepted under a very wide range of operation conditions and environments, and more particularly to a wide range of environmental temperatures.

[0015] Referring to Fig.1, a side elevation partial cross-sectional view, taken at line A, of the ammunition cartridge assembly according to the present invention is illustrated. A cartridge 100 according to the invention has a case 1 with a projectile 7 and a sabot 8 extending out of the case 1 at a front end 14 of the cartridge 100. The case 1 is made of any suitable material for use in ammunition, and more particularly, brass or steel. The case 1 is comprised of three sections, namely, a body 4, a conical form 5, and a neck 6, proceeding from a back end 12 to the front end 14 of the cartridge 100, respectively. The case 1 contains within it a propellant 2 and a priming cap 3 mounted in the back end 12 opposite the neck 6. The cartridge 100 is so dimensioned in length to allow it to operate within a pistol or compact weapon. The length of the case L3 is preferably less than or equal to about 24 millimeters and the overall length of the cartridge L4 is preferably less than or equal to about 34 millimeters. The body 4 has the largest outer diameter of the cartridge 100. Preferably, the maximum outer diameter of the body 4 is about 10.8 millimeters. Length L1 of the body 4 is preferably in the range of from approximately 16.8 to 18.2 millimeters. In a preferred embodiment, L1 measures 18 millimeters. The thickness of the casing wall preferably decreases throughout as the body 4 as the distance from the back end 12 increases.

[0016] The cartridge case 1 is reduced in diameter via a conical form 5. The conical form 5 preferably has an angle θ measured from the longitudinal axis of the case body 4 in the range of from 28 to 32 degrees, and is more preferably about 30 degrees. The conical form 5 transitions a decrease in the case diameter between the body 4 and the neck 6. The neck 6 preferably has a length L2 of about 4 millimeters. The neck 6 preferably has an outer diameter of about 8.51 millimeters and an inner of about 7.82 millimeters. In a preferred embodiment, the ratio of the outer body diameter to the outer neck diameter is about 1.27, which is sufficiently small to prevent a choking effect

of the case. Although the preferred ratio of outer body diameter to outer neck diameter is about 1.27, the design may be employed with ratios ranging from about 1.1 to 1.4 without significant loss of performance.

[0017] The projectile 7 is held within the case 1 by a sabot 8. Accordingly, the projectile diameter at its base is less than the inner diameter of the cartridge neck 6. Preferably the base diameter of the projectile is within the range of 5 to 6 millimeters, and preferably the projectile has a base diameter of about 5.7 millimeters. Preferred projectiles 7 include a standard M193 projectile, but slight changes in projectile dimensions, mass and material may be applied. Typically, these slight variances would be found amongst the standard M193 projectiles bought off-the-shelf. The preferred ratio of body outer diameter to projectile base diameter is approximately 1.89.

[0018] To hold the projectile 7 in the case 1, a sabot 8 is used which covers the base of the projectile 9 and is designed to split open at the muzzle of the weapon to release the projectile for free flight. The outer diameter of the sabot 8 is optimally approximately the same as the inner diameter of the neck 6. Preferably, the sabot 8 has a maximum outer diameter of approximately 7.82 millimeters, and an inner diameter sized to accommodate the projectile dimensions. The sabot 8 may be formed of any suitable material. Typically the sabot 8 is formed from a thermoplastic material, such as polyamide. Thermoset-type plastics are also suitable material for forming the sabot 8. A metallic base is optionally applied to the back of the sabot 8 (not illustrated in Fig. 1). The assembly of the projectile 9 and the sabot 8 is held into the cartridge case by means of a crimp 10.

[0019] The ammunition according to the invention presents many desirable features for a compact ammunition intended for use by military and law enforcement. Projectile velocity is significantly increased beyond that of existing ammunition for a sidearm type of weapon, while the recoil is reduced, and at the same time the internal pressures created by firing are acceptable for standard weapon designs.

[0020] Referring to FIG 2, a side elevation cross-section of a weapon chamber according to the present invention is illustrated. A weapon chamber

30 to fire the cartridge is illustrated which is so dimensioned that it will operate effectively with the cartridge in a pistol or compact carbine as previously described. The chamber 30 of the weapon is a generally cylindrically shaped hollow portion inside the weapon. The bottom section 20 of the chamber fits around the lower section 12 of the cartridge 100. The profile 22, 24 of the weapon chamber 30 is dimensioned to accept the conical form 5 and the neck 6, respectively, of the cartridge 100. The chamber has an upper diameter measured around profile section 24. It will be appreciated by one of ordinary skill in the art that there is a slight tolerance between the dimensions of the weapon chamber and the ammunition cartridge 100, with the weapon chamber being only slightly larger than the ammunition cartridge. The tolerance, T, between the cartridge and the chamber can range between about 3 one thousandths of an inch to about 9 one thousandths of an inch. However, a tolerance of between 3 and 4 one thousandths of an inch is preferred, with a tolerance of 4 one thousandths of an inch being the optimal tolerance level between the cartridge 100 and the chamber 30. Referring to Figs. 3A and 3B, tolerances in the weapon chamber are illustrated. Referring to Fig. 3A, where a weapon chamber 30 is manufactured at, for example, a tolerance of 4 one thousandths of an inch, there is preferably a uniform space of 2 one thousandths of an inch between the cartridge and the chamber 30. As such, the tolerance between the weapon chamber and the cartridge is as illustrated in Fig 3B. Particularly, a uniform space of ½ T lies between the cartridge and the weapon chamber 30.

[0021] Referring again to Fig. 2, in front of the chamber 30, a freebore 26 is provided which is preferably equivalent in length and diameter to the sabot. Freebore 26 is generally cylindrical and has a barrel lead 28 of 1.5 degrees formed therein adjacent to the barrel 29. When the weapon is fired, the projectile 7 exits the cartridge sitting in the chamber 30 and exits the weapon by passing through the freebore 26, the barrel lead 28, and the barrel 29.

[0022] While the invention has been described in detail with reference to preferred embodiments thereof, it will be apparent to one skilled in the art that various changes can be made, and equivalents employed, without departing

from the scope of the invention.